

### REMARKS

In response to the Office Action mailed June 12, 2007, claims 15-16 and 19-20 have been cancelled without prejudice or disclaimer, and claims 9-13 and 17-18 have been amended. Therefore, claims 9-14 and 17-18 are pending. Support for the instant amendments is provided throughout the as-filed Specification. Thus, no new matter has been added.

Reconsideration and the timely allowance of the pending claims, in view of the following remarks, are respectfully requested.

### INFORMATION DISCLOSURE STATEMENT

Applicant thanks the Examiner for considering the references cited in the Information Disclosure Statement filed on December 22, 2005, as evidenced by the signed and initialed copy of the PTO-1449 Form returned with the Office Action.

### CLAIM OBJECTIONS

The Examiner has objected to claim 15 for allegedly reciting the limitation “hydrogen peroxide” for which there is insufficient antecedent basis. [Office Action, pg. 5, ¶8].

Applicant submits that the cancellation of claim 15 renders this objection moot. Accordingly, withdrawal of the claim objection is earnestly sought.

### REJECTIONS UNDER 35 U.S.C. § 112, SECOND PARAGRAPH

I. Claims 17-20 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite in that they fail to point out what is included or excluded by the claim language. The Examiner states that it is unclear what the pH refers to. [Office Action, pg. 4, ¶5].

Applicant submits that, per embodiments of the present invention, the “controlled pH” refers to the pH for the carbon catalyst oxidation process. The “controlled pH” is the pH at which the carbon catalyst oxidation process takes place after the addition of the peroxide and catalyst and is not the pH of the feed. Applicant further submits that claims 17 and 18 have been amended to correct antecedent basis issues as well. Moreover, claims 19 and 20 have been cancelled. Accordingly, Applicant respectfully requests the withdrawal of the rejections with respect to claims 17 and 18.

II. Claims 9, 11 and 12 stand rejected under 35 U.S.C. § 112, second paragraph, because of the use of the phrase “such as” and “preferably” in the claims. [Office Action, pg. 4, ¶6].

Accordingly, Applicant has deleted references to “such as” and “preferably” in the claim 9, 11 and 12. Hence, withdrawal of the rejections with respect to these claims in respectfully requested.

#### **REJECTIONS UNDER 35 U.S.C. § 102**

I. Claims 9-12 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 4,066,550 to Beaumont [Office Action, pg. 2, ¶2].

Independent claim 9 positively recites, *inter alia*, ***adding a nitrosonium ion generator into said aqueous liquid to remove nitrogen from organic-based nitrogen contaminants at a controlled temperature.***

With this said, Applicant respectfully submits that the Beaumont citations relied upon by the Examiner do little in the way of establishing anticipation. For example, Beaumont describes an apparatus for treating sewage that broadly comprises: (a) an anaerobic system that produces from raw sewage a clear, sterilized product containing nitrogen compounds and (b) an aerobic system that removes the nitrogen compounds and reduces BOD thereof.

The anaerobic system of Beaumont comprises three sequentially operating stages for prolonged digestion of raw sewage at progressively increasing temperatures, so that distinct bacterial species are utilized. A clear product obtained from the third stage is sterilized in the fourth stage and then transferred to a heat-transfer fifth stage which is disposed to transfer heat countercurrently to the bottom of each of the first four stages.

The aerobic system of Beaumont comprises a single stage for dispersing the clear, sterilized product from the anaerobic system as a thin film in which it is cooled and aerated so that nitrogen is bacteriologically removed.

In contrast, per the embodiments of Applicant’s invention, a chemical process removes nitrogen as nitrogen gas from organic based nitrogen contaminant in aqueous liquid by adding a nitrosonium ion generator into the aqueous liquid to form an unstable intermediate which will auto-decompose at the controlled temperature of the liquid. The controlled temperature is a temperature above the auto-decomposition temperature of the “unstable intermediate”.

Furthermore, per the embodiments of Applicant’s invention, nitrogen is removed from organic based nitrogen contaminants by the addition of nitrosonium ion (NO<sup>+</sup>, positive ion)

generator at a controlled temperature. Beaumont, on the other hand, teaches that nitrogen compounds were almost completely removed by nitrites ( $\text{NO}_2^-$ , a negative ion) (see column 13, lines 42-43) and the removal is bacteriological (see column 4, lines 50-54). Beaumont fails to teach or suggest *the addition of a nitrosonium ion generator* (for example, a nitrous acid or a nitrite in an acidic media) *to remove nitrogen from organic-based nitrogen contaminants at a controlled temperature*, as required by Applicant's claim 9.

Therefore, the biological process described by Beaumont is totally different from Applicant's chemical process as claimed in claim 9. Thus, for at least these reasons, claim 9 is patentable.

Because claims 10-12 depend from claim 9, either directly or indirectly, claims 10-12 are patentable at least by virtue of their dependency as well as for their additional recitations. For example, the Examiner contends that Beaumont teaches that the controlled temperature is between  $0^\circ\text{C}$  to  $100^\circ\text{C}$ . However, Applicant submits that, in Beaumont, the increase in temperature of the entering sewage by  $15.6^\circ\text{C}$  (column 12, line 5) was used to remove the free oxygen (dissolved and gaseous) from the fluid while the temperature of  $10\text{-}50^\circ\text{C}$  stated (in column 12, line 65) was the temperature range of the anaerobic digestive process. Beaumont does not teach that the removal of nitrogen must be conducted at a temperature between  $0^\circ\text{C}$  to  $100^\circ\text{C}$ . Therefore, Beaumont does not anticipate claims 11 and 12.

Accordingly, Applicant requests the withdrawal of rejections with respect to claims 9-12.

II. Claims 13-20 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 5,356,539 to Peter [Office Action, pg. 2, ¶13].

Independent claim 13 positively recites, *inter alia*, ***adding a peroxide in the presence of an activated carbon catalyst at a controlled pH to oxidise and remove organic and inorganic contaminants.***

With this said, Applicant respectfully submits that the Peter citations relied upon by the Examiner do little in the way of establishing anticipation. For example, Peter describes a process for the removal of nitroaromatic and nitrophenolic compounds from aqueous waste streams by initially oxidizing the nitrophenolic compounds with the well known Fenton's reagent (hydrogen peroxide and ferrous ions) at a pH between 2 to 4.5, followed by a pH adjustment to  $\geq 4$  and finally adsorption of the remaining nitrophenolic compounds and all the nitroaromatic compounds by a bed of activated carbon.

In contrast, per the embodiments of Applicant's invention, both organic and inorganic contaminants in aqueous liquid are oxidized and removed by a peroxide (for example, hydrogen peroxide) in the presence of activated carbon catalyst at a controlled pH. The activated carbon catalyst is used as a particulate (solid particles) in a fixed bed or moving bed reactor through which the aqueous liquid containing the contaminants is in continuous contact with the catalyst and oxidant (for example, hydrogen peroxide).

In Peter, ferrous ions in Fenton's reagent is used as the catalyst, however, per embodiments of the claimed invention, solid activated carbon is used as the catalyst. Therefore, the reaction mechanism for the process discussed in Peter is different from Applicant's claimed process.

Moreover, Peter teaches the usage of activated carbon to remove the unoxidised nitrophenolics and all the nitroaromatic hydrocarbons in the aqueous liquid by adsorption onto the activated carbon (see column 2, line 40; column 5, lines 37-40, 48-49). Per Applicant's claimed invention, however, the activated carbon is used as the *catalyst* for the hydrogen peroxide oxidation. The activated carbon of the claimed invention performs an entirely different function as compared to the activated carbon in Peter.

Therefore, Peter fails to teach or suggest the removal of organic and inorganic contaminants by *adding a peroxide in the presence of an activated carbon catalyst*, as required by Applicant's claim 13. Hence, claim 13 is clearly patentable.

Because claims 14 and 17-18 depend from claim 13, either directly or indirectly, these claims are patentable at least by virtue of their dependency as well as for their additional recitations. For example, Peter discusses that to effect oxidation of the nitrophenolics in the waste water, the Fenton's reagent, hydrogen peroxide together with ferrous iron must be added to the waste water (column 4, lines 64-65). Peter teaches the addition of the activated carbon only after the final adjustment of the pH of the solution to  $\geq 4$  and after the Fenton's oxidation process (column 5, lines 35-40). The presence of metallic ions with the activated carbon do not affect (i.e. increase or decrease the rate of) the oxidation process.

In contrast, the pH for the carbon catalyst oxidation process, per embodiments of the present invention, is the pH of the reaction after the addition of the peroxide and catalyst and not the pH of the feed. The accelerated oxidation reaction for the claimed invention can take place in both acidic and alkali conditions (i.e. pH 2-12) unlike that of the Fenton's reagent in Peter which can only occur at a pH of  $< 4.5$ , optimum at about pH 3 (column 4, lines 62-63)

because it depends on the presence of ferrous ions in solution. Ferrous ions exist at pH of <4.5.

Peter merely teaches that the nitroaromatic wash water be left at pH 7-10 and fed continuously to the reactor along with Fenton's reagent with the pH of the reactor maintained at pH 3 (Column 4, lines 55-58). The alkali pH 7-10 for the feed is unrelated to the oxidation reaction pH 3 (acidic) for the ferrous ion (catalyst). Accordingly, Peter also does not anticipate claims 17 and 18.

Thus, for at least these reasons, claims 13-14 and 17-18 are patentable and Applicant requests the withdrawal of rejections with respect to claims 13-14 and 17-18.

### CONCLUSION

All matters having been addressed and in view of the foregoing, Applicant respectfully requests the entry of this Amendment, the Examiner's reconsideration of this application, and the immediate allowance of all pending claims.

Applicant's representative remains ready to assist the Examiner in any way to facilitate and expedite the prosecution of this matter. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

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